

11. (New) The double sided chip package in accordance with claim 7, wherein the LOC lead frame further comprises at least one power lead having a supporting portion sandwiched between the upper chip and the bottom chip, wherein the supporting portion of the at least one power lead is perpendicular to the supporting portions of the plurality of leads.--

REMARKS

Claim Rejections

Claims 1-6 stand rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter of the invention. Claims 1-6 stand further rejected under 35 U.S.C. § 102(e) as being anticipated by Masuda et al. (6,252,299). In addition, the Examiner has objected to the disclosure and to the drawings.

Amendments To Specification

Applicants have amended the specification as noted above to cure obvious grammatical and idiomatic inaccuracies. No "new matter" has been added to the original disclosure by the foregoing amendments to the specification. It is believed that the foregoing amendments to the specification obviate the outstanding objection to the disclosure.

Drawings

Applicants are submitting herewith a corrected Figure 1 which indicates that this figure illustrates the "prior art", along with a LETTER TO THE OFFICIAL DRAFTSPERSON. Entry of the corrected formal drawing is respectfully requested.

It is noted that no Patent Drawing Review (Form PTO-948) was received with the outstanding Office Action. Thus, except for the above revision to Figure 1, Applicants must assume that the drawings are acceptable as filed.

New Claims

Claims 1-6 have been canceled and new claims 7-11 have been added to this application. It is believed that the new claims specifically set forth each element of Applicants' invention in full compliance with 35 U.S.C. § 112.

The claims now more specifically point out the structure of Applicants' invention and specifically set forth a lead frame having a plurality of leads wherein an upper chip and a bottom chip are each attached to supporting portions of the leads such that the leads are sandwiched between the upper chip and the bottom chip, as clearly illustrated in Applicants' Figures 2 and 4.

It is axiomatic in U.S. patent law that, in order for a reference to anticipate a claimed structure, it must clearly disclose each and every feature of the claimed structure. It is submitted that Masuda et al. does not disclose each and every feature of Applicants' new claims and, therefore, could not possibly anticipate any of Applicants' new claims under 35 U.S.C. § 102. Specifically, Masuda et al. does not disclose the concept of attaching upper and bottom chips to opposite sides of supporting portions of the lead frames as in Applicants' invention. In every embodiment disclosed by Masuda et al., the upper and lower chips are mounted back-to-back, and the leads are located on opposite facing sides of the attached upper and lower chips. Since the chips are directly mounted to each other, Masuda et al. cannot be interpreted as teaching the subject matter of Applicants' new claims which specifically requires the supporting portions of the leads to be sandwiched between the upper chip and the bottom chip.

Given the complete lack of disclosure in Masuda et al. that the specifically disclosed structure could be modified to arrive at Applicants' claimed structure, it is submitted that Masuda et al. could not possibly render obvious any of Applicants' new claims under 35 U.S.C. § 103.

It is further noted that, in Figure 3 of Masuda et al., element numbered "6" is an "insulating film" not an "epoxy compound" as required by Applicants' claims. Thus, Applicants submit that Masuda et al. neither anticipates, nor renders obvious any of Applicants' new claims.

Version With Markings To Show Changes Made

Attached hereto is a marked-up version of the changes made to the application by the current amendment. The attached document is captioned VERSION WITH MARKINGS TO SHOW CHANGES MADE.

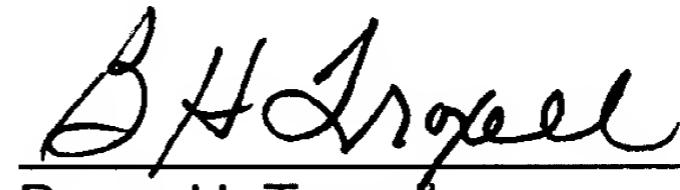
Summary

In view of the foregoing amendments and remarks, Applicants submit that this application is now in condition for allowance and such action is respectfully requested. Should any points remain in issue, which the Examiner feels could best be resolved by either a personal or a telephone interview, it is urged that Applicant's local attorney be contacted at the exchange listed below.

Respectfully submitted,

Date: September 27, 2002

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IN THE SPECIFICATION:

The following new paragraphs have been inserted between prenumbered lines 23 and 24 of page 2:

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1: A cross-sectional view of the structure of the double sided chip package in U.S. patent number 6,118,176;

Figure 2: A cross-sectional view of the double sided chip package of a first embodiment in the present invention;

Figure 3: A top view of the double sided chip package of a first embodiment before molding in the present invention;

Figure 4: A cross-sectional view of the double sided chip package of a second embodiment in the present invention; and

Figure 5: A top view of the double sided chip package of a second embodiment before molding in the present invention.

Paragraph beginning at prenumbered line 27 of page 2 has been amended as follows:

[Figure] Figures 2 and 3 demonstrate the first embodiment of the present invention, in which a double sided chip package 20 comprises a LOC lead frame, an upper chip 21, a bottom chip 22 and a package body 27.

Paragraph beginning at prenumbered line 3 of page 3 has been amended as follows:

As shown in figure 2 and 3, the LOC lead frame in the present invention is a 'Lead-On-Chip' type of lead frame. Such a lead frame can be manufactured by applying common stamping or etching technique on a thin metal board made of steel or copper. It possesses a plurality of leads 23, with each lead 23 from inside to outside being divided into a supporting portion 231, an inner connecting portion 232

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and an outer connecting portion 233. The supporting portion 231 is sandwiched between the upper chip 21 and the bottom chip 22 and is used to support the same two chips 21 and 22. The inner connecting portion 232 is inside the wire-bonding area 28, and serves as the connections between the bonding wire 26 and the leads 23. The outer connecting portion 233 is outside the [encapsulating] encapsulating area 29, and serves as the outer electricity terminals for the double sided chip package 20. Since the supporting portion 231 of the lead 23 is inwardly extended to the area between the upper chip 21 and the bottom chip 22, this LOC lead frame can also be regarded as a 'lead-between-double-chips' type of lead frame. The leads 23 can support the upper chip 21 and the bottom chip 22 simultaneously and have a better stability as they are sandwiched by the same two chips 21 and 22. Therefore, as shown in figure 2, the supporting portions 231 and the inner connecting portions 232 of the leads 23 are formed on the same plane. Such a structure can provide [a] an excellent stability without the needs of bending the leads. The supporting portion 231 and the inner connecting portion 232 is better formed on a plane P1 with equal distance to the upper chip 21 and the bottom chip 22. When injecting molding compound being the precursor of the package body 27 before curing into the 1:1 molds (along the encapsulating [encapsulating] area 29), such a structure can achieve a well-balanced molding flow without bending the leads 23. After curing, as shown in figure 2, the shape of the outer connection portion 233 of the leads 23 is bent [bend] to be gull-like or other shapes (e.g., I-like or J-like) for surface mounting.

Paragraph beginning at prenumbered line 26 of page 4 has been amended as follows:

Therefore, the double sided chip package 20 of the present invention is capable of [packageing] packaging two chips with single lead frame, and further achieves such multiple effects as less warping (no thermal expansion difference between the upper and the bottom part), less stress (the supporting portion of the

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lead is strip-shaped and can absorb stress), better protection (the upper and the bottom chip are sealed in the package body), more stabilized leads (leads are sandwiched between the upper and bottom chips) and well-balanced molding flow.

Paragraph beginning at prenumbered line 12 of page 5 has been amended as follows:

As shown in figure 5, the LOC lead frame is another type of 'lead-on-chip' lead frame comprising a plurality of leads 33 and two power leads 35. Every lead 33 is used to transfer signals generated by the upper chip 31 and the bottom chip 32, and can be further from inside to outside divided into a supporting portion 331, an inner connecting portion 332, and an outer connecting portion 333. The supporting portions 331 are sandwiched between the upper chip 31 and the bottom chip 32, and are used to support the same two chips. The inner connecting portions 332 [~~locates~~] are located in a frame-shape wire-bonding area 38 and serves as the electrical connection sections of the leads 33 for the bonding wires 36. The outer connecting portion 333 [~~locates~~] is located outside the [~~encapsulating~~] encapsulating area 39 (package body 37) and serves as the outer electrical connector for the double sided chip package 30. The power leads 35 are commonly known as the bus bar because their shape is like a handle. Inside the encapsulating [~~encapsulating~~] area 39, each power lead 35 can be further divided into a supporting portion 351 and an inner connecting portion 352 extending outwardly to the two sides. The supporting portions 351 of the power leads 35 [~~locates~~] are located among the supporting [portion] portions 331 of the other leads 33 and [~~is better to be~~] are preferably perpendicular to the supporting [portion] portions 331. Likewise, the supporting portion 351 is used to support the upper chip 31 and the bottom chip 32. The inner connecting portions 352 [~~locates~~] are located inside a frame-shaped wire-bonding area 38, and [~~serves~~] serve as the interconnections from the bonding wire 36 to the power lead 35, so as to transfer electrical power to the upper chip 21 and the bottom chip 22. With the leads 33 and 35 of the above LOC lead frame in

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between the two chips, the leads 33 can simultaneously support the upper chip 31 and the bottom chip 32 and because the leads 33 [is] are sandwiched between the same two chips, they therefore have better stability. As shown in figure 4, the supporting portions 331 and the inner connecting portions 332 of the leads 33 are formed on the same plane, such that it can achieve better stability without bending. A better situation is where the supporting [portion] portions 331 and the inner connecting [portion] portions 332 are formed on a plane P1 with the same distance to the upper chip 31 and the bottom chip 32. It can achieve well-balanced molding flow without the needs of bending the leads 33.

Paragraph beginning at prenumbered line 21 of page 6 through paragraph beginning at prenumbered line 3 of page 7 have been deleted in their entireties as follows:

[DESCRIPTIONS OF THE DRAWINGS]

Figure 1: A cross-sectional view of the structure of the double sided chip package in U.S. patent number 6,118,176;

Figure 2: A cross-sectional view of the double sided chip package of a first embodiment in the present invention;

Figure 3: A top view of the double sided chip package of a first embodiment before molding in the present invention;

Figure 4: A cross-sectional view of the double sided chip package of a second embodiment in the present invention; and

Figure 5: A top view of the double sided chip package of a second embodiment before molding in the present invention.]

IN THE CLAIMS:

Claims 1-6 have been cancelled.

New claims 7-11 have been added as follows:

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7. (New) A double sided chip package comprising:
 - a LOC lead frame having a plurality of leads, each lead having a supporting portion, an inner connecting portion and an outer connection portion, wherein the inner connecting portion is between the supporting portion and the outer connecting portion;
 - an upper chip having a first upper surface, a first bottom surface and a plurality of first bonding pads on the first upper surface, wherein the first bottom surface is attached on the supporting portions of the leads;
 - a bottom chip having a second upper surface, a second bottom surface and a plurality of second bonding pads on the second bottom surface, wherein the second upper surface is attached to and located beneath the supporting portions of the leads so that the supporting portions of the leads are sandwiched between the upper chip and the bottom chip;
 - a plurality of bonding wires electrically connecting the first bonding pads of the upper chip to the inner connecting portions of the corresponding leads, and the second bonding pads of the bottom chip to the inner connecting portions of the corresponding leads, respectively; and
 - a package body sealing the upper chip, the bottom chip, the bonding wires, the supporting portions and the inner connecting portions of the leads.
8. (New) The double sided chip package in accordance with claim 7, further comprising a plurality of tapes fixing the upper chip and the bottom chip to the supporting portions of the leads.
9. (New) The double sided chip package in accordance with claim 7, further comprising an epoxy compound filling a space between the upper chip and the bottom chip.

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10. (New) The double sided chip package in accordance with claim 7, wherein the supporting portions and the inner connecting portions of the plurality of leads are formed on a common plane.

11. (New) The double sided chip package in accordance with claim 7, wherein the LOC lead frame further comprises at least one power lead having a supporting portion sandwiched between the upper chip and the bottom chip, wherein the supporting portion of the at least one power lead is perpendicular to the supporting portions of the plurality of leads.